IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: H. MISHIMA et al.   Conf.:

Appl. No.:   NEW Divisional of   Group: unassigned
            Appln. No.: 09/520,283

Filed: February 25, 2002   Examiner: unassigned

For: DIGITAL VIDEO SIGNAL RECORD AND PLAYBACK DEVICE AND METHOD FOR RECORDING AND PLAYING BACK THE SAME
(To be Amended)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents   February 27, 2002
Washington, DC 20231

Sir:

    The following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

IN THE TITLE

    Please replace the existing title with the following new title:

    --DIGITAL VIDEO SIGNAL RECORD AND PLAYBACK DEVICE

AND METHOD FOR SELECTIVELY REPRODUCING DESIRED VIDEO

INFORMATION FROM AN OPTICAL DISK--

IN THE SPECIFICATION

Please amend the specification as follows:

Please replace the first paragraph on page 1 with the following new paragraph:

--The present invention relates to a digital video signal record and playback device for recording and playing back a digital video signal, and more particularly to a digital video signal record and playback device for recording and playing back on a medium such as an optical disc or the like, a digital video signal coded on the basis of a motion compensation prediction and an orthogonal conversion.--

Please replace the paragraph bridging pages 2 and 3 with the following new paragraph:

--FIG. 2 is a block circuit diagram showing an inside structure of the data compressing circuit 202 in FIG. 1. In FIG. 2, a digital video signal inputted from the A/D converter 201 is inputted into a memory circuit 301. A video signal 321 outputted from the memory circuit 301 is provided as a first input of a subtracter 302 and a second input of a motion compensation predicting circuit 310. An output of the subtracter 302 is inputted to a quantizer 304 via a DCT (discrete cosine transform) circuit 303. An output of

the quantizer 304 is provided as an input of a transmission buffer 306 via a variable-length encoder 305. An output of the transmission buffer 306 is outputted to the frame sector converting circuit 203. In the meantime, an output of the quantizer 304 is inputted to the inverse DCT circuit 308 via an inverse quantizer 307. An output of the inverse DCT circuit 308 is provided as a first input of an adder 309. An output 322 of the adder 309 is provided as a first input of a motion compensation predicting circuit 310. An output 323 of the motion compensation predicting circuit 310 is provided as a second input of the adder 309 and a second input of the subtracter 302.--

Please replace the paragraph bridging pages 3 and 4 with the following new paragraph:

--FIG. 3 is a block circuit diagram showing an inside structure of the motion compensation predicting circuit 310 in FIG. 2. In FIG. 3, the output 322 of the adder 309 is provided as an input terminal 401a while the output 321 of the memory circuit 301 is provided as an input terminal 401b. The signal 322 inputted from the input terminal 401a is inputted to a frame memory 404a or a frame memory 404b via a switch 403. A reference picture outputted from the frame memory 404a is provided as a first input of a motion vector detecting circuit 405a. The video signal 321 inputted from the input terminal 401b is inputted to a second input of the motion vector detecting

circuit 405a. An output of the motion vector detecting circuit 405a is inputted to a prediction mode selector 406. In the meantime, the reference picture outputted from the frame memory 404b is provided as a first input of a motion vector detecting circuit 405b. The video signal 321 inputted from the input terminal 401b is provided as the second input of the prediction mode selector 406. The video signal 321 inputted from the input terminal 401b is provided as a third input of the prediction mode selector 406. A zero signal is provided as a second input of a switch 407. A second output of the prediction mode selector 406 is provided as a third input of the switch 407. The output 323 of the switch 407 is outputted from a output terminal 402.--

Please replace the paragraph bridging pages 4 and 5 with the following new paragraph:

--FIG. 4 is a block circuit diagram showing an inside structure of the data extending circuit 217 in FIG. 1. In FIG. 4, the video signal inputted from the frame sector inverse converting circuit 216 is inputted to a reception buffer 501. An output from the reception buffer 501 is inputted to a variable-length decoder 502, and the output therefrom is inversely quanitzed at an inverse quantizer 503. Then, the output is subjected to an inverse discrete cosine transform at an inverse DCT circuit 504. The output is provided as a first input of an adder 506. In the meantime, the output of the reception buffer 501

is provided as a prediction data decoding circuit 505 while an output of the prediction data decoding circuit 505 is provided as a second output of the adder 506. The output of the adder 506 is outputted to the D/A converter 218 via a memory circuit 507.--

Please replace the first full paragraph on page 5 with the following new paragraph:

--Next, operation of the device of FIG. 1 will be explained. As one high efficiency coding mode in the case of coding a video signal, there is an coding algorithm for a MPEG (Moving Picture Expert Group) mode. This is a hybrid coding mode which combines an inter-frame prediction coding using a motion compensation prediction and an intra-frame conversion coding. This conventional example uses a data compressing circuit 202 having a structure shown in FIG. 2 and adopts the aforementioned MPEG mode.--

Please replace the paragraph bridging pages 5 and 6 with the following new paragraph:

--FIG. 5 shows a simplified data arrangement structure (layer structure) of MPEG mode. In FIG. 5, reference numeral 621 denotes a sequence layer comprising a group of pictures (hereinafter referred to as "GOP") comprising a plurality of frame data items, 622 a GOP layer comprising several pictures (screens), a 623 a slice which divides one screen into several blocks, 624 a slice

layer which has several macroblocks, 625 a macroblock layer, 626 a block layer which includes 8 pixels x 8 pixels.--

Please replace the first full paragraph on page 6 with the following new paragraph:

--This macroblock layer 625 is a block which includes a least unit of 8 pixels x 8 pixels, for example, in the MPEG mode. This block is a unit for performing DCT. At this time, a total of 6 blocks, including adjacent four Y signal blocks, one Cb block which corresponds to the Y signal blocks in position, and one Cr block are referred to as a macroblock. A plurality of these macroblocks constitute a slice. In addition, the macroblocks constitute a minimum unit of a motion compensation prediction, and a motion vector for the motion compensation prediction is formed in macroblock units.--

Please replace the paragraph bridging pages 6 and 7 with the following new paragraph:

--For example, in the case where one picture out of N pictures is set as an I picture, one picture out of M pictures is set as a P picture or I picture, (N x n + M)th picture constitutes an I picture, (N x n + M x m)th picture (m $\neq$ 1) constitutes a P picture, pictures from (N x n + M x m + 1)th picture to (N x n + M x m + M −1)th picture constitute B pictures, where n and m are integers and $1 \leq m \leq N/M$. At this time, pictures from (N x n + 1)th picture to (N x n + N)th

picture are referred to as a GOP (group of pictures) in summary.--

Please replace the first full paragraph on page 7 with the following new paragraph:

--FIG. 6 shows a case in which symbols N and M are defined as N=15 and M=3. In FIG. 6, the I picture is not subjected to the inter-frame prediction but only to the intra-frame conversion coding. The P picture is subjected to a prediction from the I picture immediately before the P picture or from the P picture. For example, the 6th picture in FIG. 6 is a P picture. The 6th picture is subjected to the prediction from the 3rd I picture. Further, the 9th P picture in FIG. 6 is subjected to the prediction from the 6th P picture. The B picture is subjected to the prediction from I picture of the P picture immediately before and after the B picture, for example, in FIG. 6, the 4th and 5th B pictures are subjected to the prediction both from the 3rd I picture and the 6th P picture. Consequently, the 4th and 5th picture are subjected to coding after coding of the 6th picture.--

Please replace the paragraph bridging pages 7 and 8 with the following new paragraph:

--Now operation of the data compressing circuit 202 will be explained in

accordance with FIG. 2. The memory circuit 301 outputs the digital video picture signals which are inputted after rearranging the signals in the coding order. In other words, as described above, for example, the first B picture is coded after the 3rd I picture in FIG. 6. Consequently, the order of pictures are rearranged. FIG. 7 shows an operation of this arrangement. A picture sequence inputted as shown in FIG. 7A is outputted in the order shown in FIG. 7B.--

Please replace the second full paragraph on page 9 with the following new paragraph:

--For example, when 1st and 2nd pictures in FIG. 7 are coded by such switching of the switch 403, the 0th P picture and the 3rd I picture are stored in the frame memory 404a and frame memory 404b, respectively. Further, when the 6th P picture is coded and decoded, the frame memory 404a is rewritten into the decoded picture of the 6th P picture.--

Please replace the paragraph bridging pages 12 and 13 with the following new paragraph:

--Further, the transmission buffer 306 decomposes a bitstream of a video signal and a bitstream of an audio signal into a plurality of packets respectively so that these packets are multiplexed including a synchronization signal thereby constituting a system stream of a MPEG2-PS (program stream). Here,

thereby constituting a system stream of a MPEG2-PS (program stream). Here, the MPEG2-PS includes a pack layer and a packet layer as shown in FIG. 8. Then the header information is added to the packet layer and the pack layer. In the conventional example, a system stream is constituted so that data of one GOP portion of the video data is included.--

Please replace the paragraph bridging pages 14 and 15 with the following new paragraph:

--Subsequently, an operation at the time of playback will be explained. At the time of the playback, the video information recorded on the optical disc 212 is amplified with the playback amplifier 213. After the information is restored to digital data at the demodulator 214 and the error correction decoder 215 followed by being restored as pure original video data free of data such as an address and a parity at the frame sector inverse converting circuit 216. Then, the data is inputted into the data extending circuit 217 which has a structure shown in FIG. 4. The system stream which includes a MPEG2-PS is inputted to the transmission buffer 501.--

Please replace the first paragraph on page 72 with the following new paragraph:

--Embodiment 1 of the present invention will be explained. FIG. 15 is a block circuit diagram showing a recording system of a digital video signal

record and playback device in embodiment 1. Referring to FIG. 15, a digital video signal outputted from an input terminal 1 is inputted to a formatting circuit 3. The video signal which is outputted from the formatting circuit 3 provided as to a first input of a subtracter 4 and a second input of a motion compensation predicting circuit 11. An output of the subtracter 4 is inputted to a quantizer 6 via a DCT circuit 5. An ouput of the quantizer 6 is provided as a first input of a buffer memory 12 via a variable-length encoder 7. In the meantime, the output of the quantizer 6 is also provided as an inverse DCT circuit 9 via an inverse quantizer 8. An output of the inverse DCT circuit 9 is given to a first input of an adder 10.--

Please replace the paragraph bridging pages 72 and 73 with the following new paragraph:

--An output of the adder 10 is provided as a first input of the motion compensation predicting circuit 11. A first output of the motion compensation predicting circuit 11 is provided as a second input of the adder 10 and a second input of the subtracter 4. Further, a second output of the motion compensation predicting circuit 11 is provided as a second input of the buffer memory 12. An output of the buffer memory 12 is inputted to a modulator 14 via a format encoder 13. An output of the modulator 14 is recorded on a recording medium such as an optical disc or the like via an output terminal

2.--

Please replace the first paragraph on page 73 with the following new paragraph:

--FIG. 16 is a block circuit diagram showing a playback system in the digital video signal record and playback device according to embodiment 1. Referring to FIG. 16, video information read from the recording medium is inputted from an input terminal 20 to a demodulator 21. An output from the demodulator 21 is inputted to the format decoder 23 via a buffer memory 22. The first output of a format decoder 23 is inputted to a variable-length decoder 24, and inversely quantized by an inverse quantizer 25. Then the output is subjected to an inverse DCT at an inverse DCT circuit 26 to be provided as the first input of an adder 28. In the meantime, the second output of the format decoder 23 is inputted to a prediction data decoding circuit 27. Then, the output from the prediction data decoding circuit 27 is given to the second input of the adder 28. The output of the adder 28 is outputted from an output terminal 30 via an unformatting circuit 29.--

Please replace the paragraph bridging pages 73 and 74 with the following new paragraph:

--Next, operation of the device will be explained. The digital video signal is inputted from the input terminal in units of lines, and is supplied to the

11

formatting circuit 3. Here, in the motion compensation prediction, one GOP is set to 15 frames as shown in FIG. 6 as in the conventional example to perform prediction coding with one frame of I picture, 4 frames of P pictures (P1 through P4), and ten frames of B pictures (B1 through B10). In this case, in the formatting circuit 3, the video data inputted in a consecutive manner is rearranged and outputted in the units of frames in the order shown in FIG. 7.--

Please replace the first full paragraph on page 74 with the following new paragraph:

--Further, the data inputted in the units of lines is rearranged in the units of blocks of 8 x 8 pixels so that macroblocks (six blocks in total, such as adjacent four luminance signal Y blocks and two color difference signals Cr and Cb blocks which correspond in position to the Y block) is constituted. The data is outputted in units of macroblocks. Here, the macroblocks are determined in the minimum unit of the motion compenation prediction while the motion vector for the motion compensation prediction is determined in the units of macroblocks.--

Please replace the second paragraph on page 74 with the following new paragraph:

--Further, with the formatting circuit 3, with respect to the I picture, one frame of video data is divided into three areas so that blocking is performed in

12

this area in the unit of 8 x 8 pixels and the macroblock is constituted and outputted. Here, the three divided areas are set as areas 1, 2 and 3 from the top of the screen as shown in FIG. 18. In FIG. 18, the area 2 located at the central part of the screen has a size of 720 pixels x 288 lines while the areas on both ends of the screen have a size of 720 pixels x 96 lines. In the meantime, in the P picture and the B picture, the blocking is performed without being divided into each area and is outputted in the units of macroblocks.--

Please replace the first paragraph on page 76 with the following new paragraph:

--Further, the address where the data of each picture area is stored at the front of the GOP is recorded as header information. The number of bytes which is occupied in the data format shown in FIG. 19 by the data in each area divided into three parts is recorded as header information. Consequently, depending on the number of bytes occupied by each area which is recorded in the header information, the end position of each area can be recognized as a relative address from the front of the GOP at the time of playback. Consequently, the optical head jumps to the front address of the GOP in the unit of the definite time at the time of the special playback so that data can be read in each area in accordance with the header information from the front of the GOP.--

Please replace the paragraph bridging pages 76 and 77 with the following new paragraph:

--With a general video signal record and playback device, on the data format at the time of data recording, the I picture is recorded in the units of frames. In contrast, in FIG. 19, a priority is given to an area located at the central part of the screen out of the I picture data which is divided into three parts so that the area is located at the front of one GOP. Consequently, in the case where only a part of the area of the I picture can be decoded in a definite time at the time of a high speed playback, at least the playback picture at the central part of the screen can be outputted.--

Please replace the first paragraph on page 77 with the following new paragraph:

--Subsequently, operation at the time of playback will be explained in accordance with FIG. 16. The demodulator 21 performs error correction processing so that the video signal recorded in a format shown in FIG. 19 in the buffer memory 22 is divided into the motion vector and the video data at the format decoder 23 to be outputted to the predicting data decoding circuit 27 and the variable-length decoder 24, respectively. Here, an operation at the time of the normal playback is the same as the conventional embodiment, and an explanation thereof is omitted.--

Please replace the second paragraph on page 77 with the following new paragraph:

--At the time of a high speed playback, with respect to the data recorded in one GOP unit on the recording medium such as an optical disc or the like, the optical head jumps to the front of the one GOP in the unit of definite time so that the data part of the I picture is read in units of areas in accordance with the header information recorded at the front so that the data is demodulated at the demodulator 21 and is input to the buffer memory 22. Here, in the case where data is read from the recording medium such as an optical disc or the like at the time of a high speed playback, waiting time for the disc rotation arises at the time of jumping to the front of the GOP even when the front address of the GOP which is recorded on the disc is known.--

Please replace the first full paragraph on page 80 with the following new paragraph:

--Next, embodiment 2 of the present invention will be explained with respect to the figures. FIG. 21 is a conceptual view for explaining a method for special playback in the case where data extension in embodiment 2 is performed. In embodiment 1, the I picture is divided into three areas as shown in FIG. 18 so that only the data of the area 2 located at the center of the area is read and played back. Thus, with respect to the areas 1 and 3, the mask data

15

is outputted. However, the data of the area 2 is extended to a size of one screen as shown in FIG. 21.--

Please replace the second paragraph on page 80 with the following new paragraph:

--In this case, at the time of converting the video signal into data in units of lines with the unformatting circuit 29, the data of the area 2 is interpolated to be extended to a size of one screen portion and is outputted. In the case of FIG. 21, the area 2 has a size of 720 pixels x 288 lines and is constituted in 144 line symmetric in vertical directions from the center of the screen.--

Please replace the first full paragraph on page 82 with the following new paragraph:

--In the aforementioned embodiment 2, the screen is extended in the vertical direction by inserting data simply in units of lines. The line data may be linearly interpolated with respect to the vertical direction.--

Please replace the paragraph bridging pages 82 and 83 with the following new paragraph:

--Next, an operation of the device will be explained. A digital video signal is inputted in units of lines from the input terminal 1 and is supplied to the formatting circuit 2. Here, in the motion compensation prediction, one GOP is

16

set to 15 frames like the conventional example as shown in FIG. 6. Then, the GOP is subjected to the prediction coding as one frame of I picture, four frames of P pictures (P1 through P4), 10 frames of B pictures (B1 through B10). In this case, in the formatting circuit 3, the video data, inputted in a continuous manner like the conventional example, is rearranged in the unit of frame in an order as shown in FIG. 7 and is outputted. Further, the data inputted in units of lines is rearranged in units of blocks having 8 x 8 pixels to constitute a macroblock (a total of six blocks of adjacent four luminance signal Y blocks and two color difference signals Cr and Cb blocks) shown in FIG. 17 so that data is outputted in the units of macroblocks. Here, the macroblock is the minimum unit of the motion compensation prediction, and the motion vector for the motion compensation prediction is determined in units of macroblocks.

Please replace the first full paragraph on page 83 with the following new paragraph:

--Further, in the formatting circuit 3, the I picture is divided into five areas for each of 720 pixels x 96 lines in the vertical direction of one frame of video data. In this area, 8 x 8 pixels are blocked to constitute a macroblock for the output. In this case, divided five areas are defined as areas 1, 2, 3, 4 and 5. In the meantime, the P picture and the B picture are blocked without being divided into areas and are outputted in units of macroblocks.--

Please replace the first full paragraph on page 84 with the following new paragraph:

--In the format encoder 13, the data of the GOP portion is outputted to the modulator 14 by rearranging the video signal in the data arrangement as shown in FIG. 23. The I picture are divided into five areas as shown in FIG. 22 so that the data of the I picture corresponding to areas 1 through 5 are defined as I(1), I(2), I(3), I(4) and I(5). In FIG. 23, the data of the I picture is constituted to be recorded in the order of I(3), I(2), I(4), I(1) and I(5) at the front of a data stream for one GOP so that priority is given to the area which comes to the center of the screen.--

Please replace the first full paragraph on page 85 with the following new paragraph:

--With a general video signal record and playback device in common use, in the data format at the time of recording, the I picture is recorded in units of frames. In contrast, in FIG. 23, a priority is given to an area located at the central part of the screen out of the five areas obtained by dividing the I picture to be arranged at the front of one GOP with the result that the playback picture at least at the central part of the screen can be outputted even in the case where only the area in part of the I picture can be decoded.--

Please replace the second full paragraph on page 87 with the following

18

new paragraph:

--In the aforementioned embodiment 3, when the whole I pictures cannot be read, the playback picture is interpolated in units of areas, the interpolation may not be made in units of areas, but may be made in error correction block.--

Please replace the paragraph bridging pages 87 and 88 with the following new paragraph:

--In this case, the demodulator 21 segments data into several byte-long packets with respect to the data arrangement shown in FIG. 23, and a error correction code is added to each packet. FIG. 25 shows an example of a case in which data in five areas inputted in a consecutive manner is divided into packets in error correction block units. FIG. 25A shows a data string before the packet division. FIG. 25B shows data after the packet division. Five areas of the I picture are divided into packets with a definite volume and the area I(3) is divided into packets from 1 through I and the I(4) is divided into packets I through j for the input.--

Please replace the paragraph bridging pages 88 and 89 with the following new paragraph:

--At the time of a high speed playback, the optical head jumps to the front of the GOP in the unit of a definite time with respect to data recorded on

the recording medium such as an optical disc or the like in the unit of GOP to read the data portion of the I picture in the unit of area in accordance with the header information. The data portion is demodulated by the demodulator 21 to be inputted to the buffer memory 22. However, in the case where the whole I picture cannot be read in a definite time because the information amount of the I picture is large, the optical head jumps to the front of the subsequent GOP even when the one area portion of data is being read. Further, data which can be read is subjected to the error correction processing so that the data which can be error corrected is inputted to the buffer memory 22. In this case, the format decoder 23 recognizes an address of the I picture area which can be decoded to the midway so that the data which can be read is decoded in units of macroblocks and is outputted as a high speed playback picture. In this case, with respect to the macroblock which cannot be decoded, data of the preceding screen is held and outputted as it is.--

Please replace the first full paragraph on page 90 with the following new paragraph.

--Next, embodiment 4 of the present invention will be explained with respect to the figures. FIG. 26 is a view showing a special playback method in embodiment 4. In embodiment 3, a special playback is performed with a playback method shown in FIG. 24. However, the special playback may be

performed so that the playback picture as shown in FIG. 26 is outputted. In this case, the format decoder 23 synthesizes one screen by playing back each one area from the I pictures of five GOP's which are continuous as shown in FIG. 26. For example, in FIG. 26A, one screen portion of the playback picture is synthesized from the I pictures of nth to the n+4th GOP so that the I picture of the n+4th GOP is played back in area 1, the I picture of the n+3th GOP is played back in area 2, the I picture of the n+2th GOP is played back in area 3, the I picture of the n+1th GOP is played back in area 4, and the I picture of the nth GOP is played back in area 5. Further, referring to FIG. 26, when an attention is paid to the area 5, the I picture of the nth, n+1th, n+2th --- GOP are played back as the played back video data.--

Please replace the paragraph bridging pages 91 and 92 with the following new paragraph:

--Next, embodiment 5 of the present invention will be explained with respect to the figures. FIG. 28 is a view showing an arrangement structure of a digital video signal data according to embodiment 5. In embodiment 3, the data arrangement is written in the order of the areas 3, 2, 4, 1 and 5 with respect to the I picture as shown in FIG. 23. The arrangement may have a structure shown in FIG. 28. In FIG. 28, when the data of the I picture is recorded at the front portion of the data arrangement of one GOP portion, the

area number at the front of each of the GOPs is scrolled. In other words, as shown in FIG. 28, when the I picture data is recorded in the order of I(5), I(1), I(2), I(3), and I(4) in the nth GOP, the I picture data is recorded in the order of I(1), I(2), I(3), I(4) and I(5) in the n+1th GOP. Further, I(2) comes first in the n+2th GOP. When the GOP number becomes n+3 and n+4 and ---, the front area is sequentially scrolled and recorded in the order of I(3), I(4), I(5), I(1) and ---.--

Please replace the paragraph bridging pages 94 and 95 with the following new paragraph:

--Next, embodiment 6 of the present invention will be explained with respect to figures. FIG. 30 is a view showing a data arrangement structure of a digital video data according to embodiment 6. In this case, the I pictures and the P pictures are divided into five areas each having 720 pixels x 96 lines so that each area is blocked in the unit of the macroblock and is coded as shown in FIG. 22. Each P picture is divided into five areas. The motion compensation prediction is performed and coded in such a manner that the retrieval scope of the reference pattern of the motion compensation prediction closes in the area. Here, the divided five areas are defined as areas 1, 2, 3, 4 and 5 from the top. Further, with respect to the B picture, the motion compensation prediction is performed and coded without being divided into areas.--

Please replace the first full paragraph on page 98 with the following new

paragraph:

--In the aforementioned embodiment 6, in the case where the whole I picture and the whole P picture cannot be read, the playback picture is interpolated in units of areas. However, the interpolation may not be performed in area units, but it may be performed in units of error correction codes.--

Please replace the paragraph bridging pages 98 and 99 with the following new paragraph:

--At the time of the high speed playback, the optical head jumps to the front of the GOP in units of a definite time with respect to the data which is recorded in the unit of GOP on the recording medium such as an optical disc or the like with the result that the data portion of the I picture is read in units of area in accordance with the header information and is demodulated at the demodulator 21 and is inputted to the buffer memory 22. However, in the case where the information amount of the I picture is so large that the whole I picture and the whole P pictures cannot be read in a definite time, the optical head jumps to the front of the next GOP even in the midst of reading the data in one area portion. Further, the data that has been read is subjected to an error correction processing, and the data that can be error corrected is inputted to the buffer memory 22. In this case, the format decoder 23

23

recognizes the address of the I picture and the P pictures that can be decoded halfways so that the data that can be read is decoded in the unit of macroblock and is outputted as a high speed playback picture. In this case, with respect to the macroblock that cannot be decoded, the data of the preceding screen is held it is end and is outputted.--

Please replace the first full paragraph on page 101 with the following new paragraph:

--Next, embodiment 8 of the present invention will be explained with respect to the figures. FIG. 35 is a view showing a digital video data arrangement structure in embodiment 8. In embodiment 6, the data arrangement is written in the order of the areas, 3, 2, 4, 1 and 5 as shown in FIG. 30, but the arrangement may have a structure as shown in FIG. 35.--

Please replace the first full paragraph on page 102 with the following new paragraph:

--In this case, since the position where the I picture and P picture areas divided into five parts are scrolled in the units of frames, it never happens tha the area which is not decoded is not concentrated on the fixed position on the screen even in the case where only a part of the areas of the I picture and the P picture can be decoded.--

Please replace the paragraph bridging pages 102 and 103 with the following new paragraph:

--At the time of the high speed special playback, the data which is recorded on the recording medium such as an optical disc or the like in units of one GOP is read in units of area in accordance with header information. Then, the data is demodulated by the demodulator 21 and is inputted to the buffer memory 22. However, when the information amount of the I picture and the P picture is so large that the whole I picture and the whole P picture cannot be read in a definite time, the data is read to the last with respect to the area read halfways. Then, the optical head jumps to the front of the GOP to input data only of the area which can be inputted into the buffer memory 22. In this case, the format encoder 23 decodes only the area of the I picture and the P picture, and is outputted as a high speed playback picture.

IN THE CLAIMS

Please cancel claims 1-45 without disclaimer to the subject matter contained therein.

Please add the following claims:

--46. (New) A digital video signal playback device for reproducing digital video information from an optical disk, said device comprising:

disk rotation means for rotating said optical disk, said optical disk

storing digital video information that includes I-picture data for intra-frame coded pictures, P-picture data for predictive coded pictures, and B-picture data for bi-directionally predictive coded pictures, said digital video information being arranged in a plurality of fixed length image data blocks each of which includes data for a sequence of I-, P-, and B-pictures;

counting means for counting a number of image data blocks to calculate a position of desired video information on said optical disk; and

an optical head for emitting light onto a portion of said optical disk in accordance with the calculated position of desired video information and detecting light reflected from said optical disk to generate a playback signal that is used to reproduce said desired video information from said optical disk.

47. (New) The digital video signal playback device according to claim 46, wherein each image data block is a group of pictures.

48. (New) The digital video signal playback device according to claim 46, wherein said desired video information is special playback data.

49. (New) A method of reproducing digital video information from an optical disk, said method comprising:

rotating said optical disk, said optical disk storing digital video information that includes I-picture data for intra-frame coded pictures, P-picture data for predictive coded pictures, and B-picture data for bi-directionally predictive coded pictures, said digital video information being arranged in a plurality of fixed length image data blocks each of which includes data for a sequence of I-, P-, and B-pictures;

counting a number of image data blocks to calculate a position of desired video information on said optical disk;

emitting light onto a portion of said optical disk in accordance the calculated position of desired video information; and

detecting light reflected from said optical disk to generate a playback signal that is used to reproduce the desired video information.

50. (New) The method according to claim 49, wherein each image data block is a group of pictures.

51. (New) The method according to claim 49, wherein said desired video information is special playback data.--

REMARKS

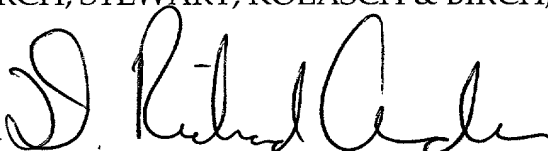Claims 46-51 are now pending in the present application.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

The Examiner is respectfully requested to contact D. Richard Anderson (Reg. 40,439) at the telephone number of the undersigned below to schedule a personal interview before issuing a first Office Action for this application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fee required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By

D. Richard Anderson 40,439

DRA:ll
1560-0375P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Marked-Up Version to Show Changes Made

The first paragraph on page 1 has been amended as follows:

The present invention relates to a digital video signal record and playback device for recording and playing back a digital video signal, and more particularly to a digital video signal record and playback device for recording and playing back on a medium such as an optical disc or the like, a digital video signal coded on the basis of a motion compensation prediction and an orthogonal conversion.

The paragraph bridging pages 2 and 3 has been amended as follows:

FIG. 2 is a block circuit diagram showing an inside structure of the data compressing circuit 202 in FIG. 1. In FIG. 2, a digital video signal inputted from the A/D converter 201 is inputted into a memory circuit 301. A video signal 321 outputted from the memory circuit 301 is [given to] provided as a first input of a subtracter 302 and a second input of a motion compensation predicting circuit 310. An output of the subtracter 302 is inputted to a quantizer 304 via a DCT (discrete cosine transform) circuit 303. An output of the quantizer 304 is [given to] provided as an input of a transmission buffer 306 via a variable-length encoder 305. An output of the transmission buffer 306 is outputted to the frame sector converting circuit 203. In the meantime,

an output of the quantizer 304 is inputted to the inverse DCT circuit 308 via an inverse quantizer 307. An output of the inverse DCT circuit 308 is [given to] provided as a first input of an adder 309. An output 322 of the adder 309 is [given to] provided as a first input of a motion compensation predicting circuit 310. An output 323 of the motion compensation predicting circuit 310 is [given to] provided as a second input of the adder 309 and a second input of the subtracter 302.

The paragraph bridging pages 3 and 4 has been amended as follows:

FIG. 3 is a block circuit diagram showing an inside structure of the motion compensation predicting circuit 310 in FIG. 2. In FIG. 3, the output 322 of the adder 309 is [given to] provided as an input terminal 401a while the output 321 of the memory circuit 301 is [given to] provided as an input terminal 401b. The signal 322 inputted from the input terminal 401a is inputted to a frame memory 404a or a frame memory 404b via a switch 403. A reference picture outputted from the frame memory 404a is [given to] provided as a first input of a motion vector detecting circuit 405a. The video signal 321 inputted from the input terminal 401b is inputted to a second input of the motion vector detecting circuit 405a. An output of the motion vector detecting circuit 405a is inputted to a prediction mode selector 406. In the meantime,

the reference picture outputted from the frame memory 404b is [given to] provided as a first input of a motion vector detecting circuit 405b. The video signal 321 inputted from the input terminal 401b is [given to] provided as the second input of the prediction mode selector 406. The video signal 321 inputted from the input terminal 401b is [given to] provided as a third input of the prediction mode selector 406. A zero signal is [given to] provided as a second input of a [switcher] switch 407. A second output of the prediction mode selector 406 is [given to] provided as a third input of the [switcher] switch 407. The output 323 of the [switcher] switch 407 is outputted from a output terminal 402.

The paragraph bridging pages 4 and 5 has been amended as follows:

FIG. 4 is a block circuit diagram showing an inside structure of the data extending circuit 217 in FIG. 1. In FIG. 4, the video signal inputted from the frame sector inverse converting circuit 216 is inputted to a reception buffer 501. An output from the reception buffer 501 is inputted to a variable-length decoder 502, and the output therefrom is inversely quanitzed at an inverse quantizer 503. Then, the output is subjected to an inverse discrete cosine transform at an inverse DCT circuit 504. The output is [given to] provided as a first input of an adder 506. In the meantime, the output of the reception buffer

31

501 is [given to] provided as a prediction data decoding circuit 505 while an output of the prediction data decoding circuit 505 is [given to] provided as a second output of the adder 506. The output of the adder 506 is outputted to the D/A converter 218 via a memory circuit 507.

The first full paragraph on page 5 has been amended as follows:

Next, [an] operation of the device of FIG. 1 will be explained. As one high efficiency coding mode in the case of coding a video signal, there is an coding algorithm [by means of] for a MPEG (Moving Picture Expert Group) mode. This is a hybrid coding mode which combines an inter-frame prediction coding using a motion compensation prediction and an intra-frame conversion coding. This conventional example uses a data compressing circuit 202 having a structure shown in FIG. 2 and adopts the aforementioned MPEG mode.

The paragraph bridging pages 5 and 6 has been amended as follows:

FIG. 5 shows a simplified data arrangement structure (layer structure) of MPEG mode. In FIG. 5, reference numeral 621 denotes a sequence layer comprising a group of pictures (hereinafter referred to as "GOP") comprising a plurality of frame data items, 622 a GOP layer comprising several pictures (screens), a 623 a slice which divides one screen into several blocks, 624 a slice

32

layer which has several macroblocks, 625 a macroblock layer, 626 a block layer which [consists of] includes 8 pixels x 8 pixels.

The first full paragraph on page 6 has been amended as follows:

This macroblock layer 625 is a block which [consists of] includes a least unit of 8 pixels x 8 pixels, for example, in the MPEG mode. This block is a unit for performing DCT. At this time, a total of 6 blocks, including adjacent four Y signal blocks, one Cb block which corresponds to the Y signal blocks in position, and one Cr block are referred to as a [macroblocks] macroblock. A plurality of these macroblocks constitute a slice. In addition, the macroblocks constitute a minimum unit of a motion compensation prediction, and a motion vector for the motion compensation prediction is formed in macroblock units.

The paragraph bridging pages 6 and 7 has been amended as follows:

For example, in the case where one picture out of N pictures is set [to] as an I picture, one picture out of M pictures is set [to] as a P picture or I picture, $(N \times n + M)$th picture constitutes an I picture, $(N \times n + M \times m)$th picture $(m \neq 1)$ constitutes a P picture, pictures from $(N \times n + M \times m + 1)$th picture to $(N \times n + M \times m + M - 1)$th picture constitute B pictures, where n and m are integers and $1 \leq m \leq N/M$. At this time, pictures from $(N \times n + 1)$th picture to $(N \times n + N)$th

picture are referred to as a GOP (group of pictures) in summary.

The first full paragraph on page 7 has been amended as follows:

FIG. 6 shows a case in which symbols N and M are defined as N=15 and M=3. In FIG. 6, the I picture is not subjected to the inter-frame prediction but only to the intra-frame conversion coding. The P picture is subjected to a prediction from the I picture immediately before the P picture or from the P picture. For example, the 6th picture in FIG. 6 is a P picture. The 6th picture is subjected to the prediction from the 3rd I picture. Further, the 9th P picture in FIG. 6 is subjected to the prediction from the 6th P picture. The B picture is subjected to the prediction from I picture of the P picture immediately before and after the B picture, for example, in FIG. 6, the 4th and 5th B pictures [is] are subjected to the prediction both from the 3rd I picture and the 6th P picture. Consequently, the 4th and 5th picture [is] are subjected to coding after coding of the 6th picture.

The paragraph bridging pages 7 and 8 has been amended as follows:

[Then, an] Now operation of [a] the data compressing circuit 202 will be explained in accordance with FIG. 2. The memory circuit 301 outputs the digital video picture signals which are inputted after rearranging the signals in

the coding order. In other words, as described above, for example, the first B picture is coded after the 3rd I picture in FIG. 6. Consequently, the order of pictures are rearranged. FIG. 7 shows an operation of this arrangement. [An] A picture sequence inputted as shown in FIG. 7A is outputted in the order shown in FIG. 7B.

The second full paragraph on page 9 has been amended as follows:

For example, when 1st and 2nd pictures in FIG. 7 are coded by such switching of the [switcher] switch 403, the Oth P picture and the 3rd I picture are stored in the frame memory 404a and frame memory 404b, respectively. Further, when the 6th P picture is coded and decoded, the frame memory 404a is rewritten into the decoded picture of the 6th P picture.

The paragraph bridging pages 12 and 13 with the following new paragraph:

Further, the transmission buffer 306 decomposes a bitstream of a video signal and a bitstream of an audio signal into a plurality of packets respectively so that these packets are multiplexed including a synchronization signal thereby constituting a system stream of a MPEG2-PS (program stream). Here, the MPEG2-PS [consists of] includes a pack layer and a packet layer as shown

35

in FIG. 8. Then the header information is added to the packet layer and the pack layer. In the conventional example, a system stream is constituted so that data of one GOP portion of the video data is included.

The paragraph bridging pages 14 and 15 has been amended as follows:

Subsequently, an operation at the time of playback will be explained. At the time of the playback, the video information recorded on the optical disc 212 is amplified with the playback amplifier 213. After the information is restored to digital data at the demodulator 214 and the error correction decoder 215 followed by being restored as pure original video data free of data such as an address and a parity at the frame sector inverse converting circuit 216. Then, the data is inputted into the data extending circuit 217 which has a structure shown in FIG. 4. The system stream which [consists of] includes a MPEG2-PS is inputted to the transmission buffer 501.

The first paragraph on page 72 has been amended as follows:

Embodiment 1 of the present invention will be explained. FIG. 15 is a block circuit diagram showing a recording system of a digital video signal record and playback device in embodiment 1. Referring to FIG. 15, a digital video signal outputted from an input terminal 1 is inputted to a formatting

circuit 3. The video signal which is outputted from the formatting circuit 3 [is inputted] provided as to a first input of a subtracter 4 and a second input of a motion compensation predicting circuit 11. An output of the subtracter 4 is inputted to a quantizer 6 via a DCT circuit 5. An ouput of the quantizer 6 is [inputted to] provided as a first input of a buffer memory 12 via a variable-length encoder 7. In the meantime, the output of the quantizer 6 is also [inputted to] provided as an inverse DCT circuit 9 via an inverse quantizer 8. An output of the inverse DCT circuit 9 is given to a first input of an adder 10.

The paragraph bridging pages 72 and 73 has been amended as follows:

An output of the adder 10 is [given to] provided as a first input of the motion compensation predicting circuit 11. A first output of the motion compensation predicting circuit 11 is [given to] provided as a second input of the adder 10 and a second input of the subtracter 4. Further, a second output of the motion compensation predicting circuit 11 is [given to] provided as a second input of the buffer memory 12. An output of the buffer memory 12 is inputted to a modulator 14 via a format encoder 13. An output of the modulator 14 is recorded on a recording medium such as an optical disc or the like via an output terminal 2.

The first paragraph on page 73 has been amended as follows:

FIG. 16 is a block circuit diagram showing a playback system in the digital video signal record and playback device according to embodiment 1. Referring to FIG. 16, video information read from the recording medium is inputted from an input terminal 20 to a demodulator 21. An output from the demodulator 21 is inputted to the format decoder 23 via a buffer memory 22. The first output of a format decoder 23 is inputted to a variable-length decoder 24, and inversely quantized [at] by an inverse quantizer 25. Then the output is subjected to [the] an inverse DCT at an inverse DCT circuit 26 to be [given to] provided as the first input of an adder 28. In the meantime, the second output of the format decoder 23 is inputted to a prediction data decoding circuit 27. Then, the output from the prediction data decoding circuit 27 is given to the second input of the adder 28. The output of the adder 28 is outputted from an output terminal 30 via an unformatting circuit 29.

The paragraph bridging pages 73 and 74 has been amended as follows:

Next, [an] operation of the device will be explained. The digital video signal is inputted from the input terminal in [the unit of line] units of lines, and is supplied to the formatting circuit 3. Here, in the motion compensation prediction, one GOP is set to 15 frames as shown in FIG. 6 [like] as in the

conventional example to perform prediction coding with one frame of I picture, 4 frames of P pictures (P1 through P4), and ten frames of B pictures (B1 through B10). In this case, in the formatting circuit 3, the vieo data inputted in a consecutive manner is rearranged and outputted in the [unit of frame] units of frames in the order shown in FIG. 7.

The first full paragraph on page 74 has been amended as follows:

Further, the data inputted in the [unit of line] units of lines is rearranged in the [unit of block] units of blocks of 8 x 8 pixels so that macroblocks (six blocks in total, such as adjacent four luminance signal Y blocks and two color difference signals Cr and Cb blocks which correspond in position to the Y block) is constituted. The data is outputted in [the unit] units of [macroblock] macroblocks. Here, the macroblocks are determined in the minimum unit of the motion compenation prediction while the motion vector for the motion compensation prediction is determined in the [unit of macroblock] units of macroblocks.

The second paragraph on page 74 has been amended as follows:

Further, with the formatting circuit 3, with respect to the I picture, one frame of video data is divided into three areas so that blocking is performed in

this area in the unit of 8 x 8 pixels and the macroblock is constituted and outputted. Here, the three divided areas are set as areas 1, 2 and 3 from the top of the screen as shown in FIG. 18. In FIG. 18, the area 2 located at the central part of the screen has a size of 720 pixels x 288 lines while the areas on both ends of the screen have a size of 720 pixels x 96 lines. In the meantime, in the P picture and the B picture, the blocking is performed without being divided into each area and is outputted in the [unit of macroblock] units of macroblocks.

The first paragraph on page 76 has been amended as follows:

Further, the address where [th] the data of each picture area is stored at the front of the GOP is recorded as header information. The number of bytes which is occupied in the data format shown in FIG. 19 by the data in each area divided into three parts is recorded as header information. Consequently, depending on the number of bytes occupied by each area which is recorded in the header information, the end position of each area can be recognized as a relative address from the front of the GOP at the time of playback. Consequently, the optical head jumps to the front address of the GOP in the unit of the definite time at the time of the special playback so that data can be read in each area in accordance with the header information from the front of

the GOP.

The paragraph bridging pages 76 and 77 has been amended as follows:

With a general video signal record and playback device, on the data format at the time of data recording, the I picture is recorded in [the unit of frame] the units of frames. In contrast, in FIG. 19, a priority is given to an area located at the central part of the screen out of the I picture data which is divided into three parts so that the area is located at the front of one GOP. Consequently, in the case where only a part of the area of the I picture can be decoded in a definite time at the time of a high speed playback, at least the playback picture at the central part of the screen can be outputted.

The first paragraph on page 77 has been amended as follows:

Subsequently, [an] operation at the time of playback will be explained in accordance with FIG. 16. The demodulator 21 performs [an] error correction processing so that the video signal recorded in a format shown in FIG. 19 in the buffer memory 22 is divided into the motion vector and the video data at the format decoder 23 to be outputted to the predicting data decoding circuit 27 and the variable-length decoder 24, respectively. Here, an operation at the time of the normal playback is the same as the conventional embodiment, and

an explanation thereof is omitted.

The second paragraph on page 77 has been amended as follows:

At the time of a high speed playback, with respect to the data recorded in one GOP unit on the recording medium such as an optical disc or the like, the optical head jumps to the front of the one GOP in the unit of definite time so that the data part of the I picture is read in [the unit of area] units of areas in accordance with the header information recorded at the front so that the data is demodulated at the demodulator 21 and is input to the buffer memory 22. Here, in the case where data is read from the recording medium such as an optical disc or the like at the time of a high speed playback, waiting time for the disc rotation arises at the time of jumping to the front of the GOP even when the front address of the GOP which is recorded on the disc is known.

The first full paragraph on page 80 has been amended as follows:

Next, embodiment 2 of the present invention will be explained with respect to [drawings] the figures. FIG. 21 is a conceptual view for explaining a method for special playback in the case where data extension in embodiment 2 is performed. In embodiment 1, the I picture is divided into three areas as shown in FIG. 18 so that only the data of the area 2 located at the center of the

area is read and played back. Thus, with respect to the areas 1 and 3, the mask data is outputted. However, the data of the area 2 is extended to a size of one screen as shown in FIG. 21.

The second paragraph on page 80 has been amended as follows:

In this case, at the time of converting the video signal into data in [the unit of line] units of lines with the unformatting circuit 29, the data of the area 2 is interpolated to be extended to a size of one screen portion and is outputted. In the case of FIG. 21, the area 2 has a size of 720 pixels x 288 lines and is constituted in 144 line symmetric in vertical directions from the center of the screen.

The first full paragraph on page 82 has been amended as follows:

In the aforementioned embodiment 2, the screen is extended in the vertical direction by inserting data simply in [the unit of line] units of lines. The line data may be linearly interpolated with respect to the vertical direction.

The paragraph bridging pages 82 and 83 has been amended as follows:

Next, an operation of the device will be explained. A digital video signal

is inputted in [the unit of line] units of lines from the input terminal 1 and is supplied to the formatting circuit 2. Here, in the motion compensation prediction, one GOP is set to 15 frames like the conventional example as shown in FIG. 6. Then, the GOP is subjected to the prediction coding as one frame of I picture, four frames of P pictures (P1 through P4), 10 frames of B pictures (B1 through B10). In this case, in the formatting circuit 3, the video data, inputted in a continuous manner like the conventional example, is rearranged in the unit of frame in an order as shown in FIG. 7 and is outputted. Further, the data inputted in [the unit of line] units of lines is rearranged in [the unit of block] units of blocks having 8 x 8 pixels to constitute a macroblock (a total of six blocks of adjacent four luminance signal Y blocks and two color difference signals Cr and Cb blocks) shown in FIG. 17 so that [the] data is outputted in the [unit of macroblock] units of macroblocks. Here, the macroblock is the minimum unit of the motion compensation prediction, and the motion vector for the motion compensation prediction is determined in [the unit of macroblock] units of macroblocks.

The first full paragraph on page 83 has been amended as follows:

Further, in the formatting circuit 3, the I picture is divided into five areas for each of 720 pixels x 96 lines in the vertical direction of one frame of video

data. In this area, 8 x 8 pixels are blocked to constitute a macroblock for the output. In this case, divided five areas are defined as areas 1, 2, 3, 4 and 5. In the meantime, the P picture and the B picture are blocked without being divided into areas and [is] are outputted in [the unit of macroblock] units of macroblocks.

The first full paragraph on page 84 has been amended as follows:

In the format encoder 13, the data of the GOP portion is outputted to the modulator 14 by rearranging the video signal in the data arrangement as shown in FIG. 23. The I picture are divided into five areas as shown in FIG. 22 so that the data of the I picture corresponding to areas 1 through 5 are defined as I(1), I(2), I(3), I(4) and I(5). In FIG. 23, the data of the I picture is constituted to be recorded in the order of [I(1), I(2), I(3), I(4)] I(3), I(2), I(4), I(1) and I(5) at the front of a data stream for one GOP so that priority is given to the area which comes to the center of the screen.

The first full paragraph on page 85 has been amended as follows:

With a general video signal record and playback device in common use, in the data format at the time of recording, the I picture is recorded in [the unit of frame] units of frames. In contrast, in FIG. 23, a priority is given to an area

located at the central part of the screen out of the five areas obtained by dividing the I picture to be arranged at the front of one GOP with the result that the playback picture at least at the central part of the screen can be outputted even in the case where only the area in part of the I picture can be decoded.

The second full paragraph on page 87 has been amended as follows:

In the aforementioned embodiment 3, when the whole I pictures cannot be read, the playback picture is interpolated in [the unit] units of [area] areas, the interpolation may not be made in [the unit of area] units of areas, but may be made in [the unit of] error correction block.

The paragraph bridging pages 87 and 88 has been amended as follows:

In this case, the demodulator 21 segments data into several byte-long packets with respect to the data arrangement shown in FIG. 23, and a error correction code is added to each packet. FIG. 25 shows an example of a case in which data in five areas inputted in a consecutive manner is divided into packets in [the unit of] error correction block [unit] units. FIG. 25A shows a data string before the packet division. FIG. 25B shows data after the packet division. Five areas of the I picture are divided into packets with a definite volume and the area I(3) is divided into packets from 1 through I and the I(4) is

divided into packets I through j for the input.

The paragraph bridging pages 88 and 89 with has been amended as follows:

At the time of a high speed playback, the optical head jumps to the front of the GOP in the unit of a definite time with respect to data recorded on the recording medium such as an optical disc or the like in the unit of GOP to read the data portion of the I picture in the unit of area in accordance with the header information. The data portion is demodulated by the demodulator 21 to be inputted to the buffer memory 22. However, in the case where the whole I picture cannot be read in a definite time because the information amount of the I picture is large, the optical head jumps to the front of the subsequent GOP even when the one area portion of data is being read. Further, data which can be read is subjected to the error correction processing so that the data which can be error corrected is inputted to the buffer memory 22. In this case, the format decoder 23 recognizes an address of the I picture area which can be decoded to the midway so that the data which can be read is decoded in [the] [unit of macroblock] units of macroblocks and is outputted as a high speed playback picture. In this case, with respect to the macroblock which cannot be decoded, data of the preceding screen is held and outputted [at] as it is.

The first full paragraph on page 90 has been amended as follows.

Next, embodiment 4 of the present invention will be explained with respect to [drawings] the figures. FIG. 26 is a view showing a special playback method in embodiment 4. In embodiment 3, a special playback is performed with a playback method shown in FIG. 24. However, the special playback may be performed so that the playback picture as shown in FIG. 26 is outputted. In this case, the format decoder 23 synthesizes one screen by playing back each one area from the I pictures of five GOP's which are continuous as shown in FIG. 26. For example, in FIG. 26A, one screen portion of the playback picture is synthesized from the I pictures of nth to the n+4th GOP so that the I picture of the n+4th GOP is played back in area 1, the I picture of the n+3th GOP is played back in area 2, the I picture of the n+2th GOP is played back in area 3, the I picture of the n+1th GOP is played back in area 4, and the I picture of the nth GOP is played back in area 5. Further, referring to FIG. 26, when an attention is paid to the area 5, the I picture of the nth, n+1th, n+2th --- GOP are played back as the played back video data.

The paragraph bridging pages 91 and 92 has been amended as follows:

--Next, embodiment 5 of the present invention will be explained with

48

respect to the [drawings] figures. FIG. 28 is a view showing an arrangement structure of a digital video signal data according to embodiment 5. In embodiment 3, the data arrangement is written in the order of the areas 3, 2, 4, 1 and 5 with respect to the I picture as shown in FIG. 23. The arrangement may have a structure shown in FIG. 28. In FIG. 28, when the data of the I picture is recorded at the front portion of the data arrangement of one GOP portion, the area number at the front of each of the GOPs is scrolled. In other words, as shown in FIG. 28, when the I picture data is recorded in the order of I(5), I(1), I(2), I(3), and I(4) in the nth GOP, the I picture data is recorded in the order of I(1), I(2), I(3), I(4) and I(5) in the n+1th GOP. Further, I(2) comes first in the n+2th GOP. When the GOP number becomes n+3 and n+4 and ---, the front area is sequentially scrolled and recorded in the order of I(3), I(4), I(5), I(1) and ---.

Please replace the paragraph bridging pages 94 and 95 with the following new paragraph:

Next, embodiment 6 of the present invention will be explained with respect to [drawings] figures. FIG. 30 is a view showing a data arrangement structure of a digital video data according to embodiment 6. In this case, the I [picture] pictures and the P [picture] pictures are divided into five areas each having 720 pixels x 96 lines so that each area is blocked in the unit of the macroblock and is coded as shown in FIG. 22. [However, the] Each P picture is

divided into five [area] areas. The motion compensation prediction is performed and coded in such a manner that the retrieval scope of the reference pattern of the motion compensation prediction closes in the area. Here, the divided five areas are defined as areas 1, 2, 3, 4 and 5 from the top. Further, with respect to the B picture, the motion compensation prediction is performed and coded without being divided into areas.

The paragraph bridging pages 94 and 95 has been amended as follows:

Next, embodiment 6 of the present invention will be explained with respect to [drawings] figures. FIG. 30 is a view showing a data arrangement structure of a digital video data according to embodiment 6. In this case, the I [picture] pictures and the P [picture] pictures are divided into five areas each having 720 pixels x 96 lines so that each area is blocked in the unit of the macroblock and is coded as shown in FIG. 22. [However, the] Each P picture is divided into five [area] areas. The motion compensation prediction is performed and coded in such a manner that the retrieval scope of the reference pattern of the motion compensation prediction closes in the area. Here, the divided five areas are defined as areas 1, 2, 3, 4 and 5 from the top. Further, with respect to the B picture, the motion compensation prediction is performed and coded without being divided into areas.

The first full paragraph on page 98 has been amended as follows:

In the aforementioned embodiment 6, in the case where the whole I picture and the whole P picture cannot be read, the playback picture is interpolated in [the unit of area] units of areas. However, the interpolation may not be performed in [the] area [unit] units, but it may be performed in [the unit] units of error correction [code] codes.

The paragraph bridging pages 98 and 99 has been amended as follows:

At the time of the high speed playback, the optical head jumps to the front of the GOP in [the unit] units of a definite time with respect to the data which is recorded in the unit of GOP on the recording medium such as an optical disc or the like with the result that the data portion of the I picture is read in [the unit of area] units of area in accordance with the header information and is demodulated at the demodulator 21 and is inputted to the buffer memory 22. However, in the case where the information amount of the I picture is so large that the whole I picture and the whole P pictures cannot be read in a definite time, the optical head jumps to the front of the next GOP even in the midst of reading the data in one area portion. Further, the data that has been read is subjected to an error correction processing, and the data that can be error corrected is inputted to the buffer memory 22. In this case,

the format decoder 23 recognizes the address of the I picture and the P pictures that can be decoded halfways so that the data that can be read is decoded in the unit of macroblock and is outputted as a high speed playback picture. In this case, with respect to the macroblock that cannot be decoded, the data of the preceding screen is held it is end and is outputted.

The first full paragraph on page 101 has been amended as follows:

Next, embodiment 8 of the present invention will be explained with respect to [drawings] the figures. FIG. 35 is a view showing a digital video data arrangement structure in embodiment 8. In embodiment 6, the data arrangement is written in the order of the areas, 3, 2, 4, 1 and 5 as shown in FIG. 30, but the arrangement may have a structure as shown in FIG. 35.

The first full paragraph on page 102 has been amended as follows:

In this case, since the position where the I picture and P picture areas divided into five parts are scrolled in the [unit of frame] units of frames, it never happens tha the area which is not decoded is not concentrated on the fixed position on the screen even in the case where only a part of the areas of the I picture and the P picture can be decoded.

The paragraph bridging pages 102 and 103 has been amended as follows:

At the time of the high speed special playback, the data which is recorded on the recording medium such as an optical disc or the like in [the unit] units of one GOP is read in [the unit] units of area [unit] in accordance with header information. Then, the data is demodulated by the demodulator 21 and is inputted to the buffer memory 22. However, when the information amount of the I picture and the P picture is so large that the whole I picture and the whole P picture cannot be read in a definite time, the data is read to the last with respect to the area read halfways. Then, the optical head jumps to the front of the GOP to input data only of the area which can be inputted into the buffer memory 22. In this case, the format encoder 23 decodes only the area of the I picture and the P picture, and is outputted as a high speed playback picture.

IN THE CLAIMS

Claims 1-45 have been cancelled.

Claims 46-51 have been added.